

REMARKS

By the above amendment, the title has been amended to be more clearly indicative of the claimed invention, minor informalities in the specification including those noted by the Examiner have been corrected and the claims have been amended to overcome the points noted by the Examiner with independent claims 1 and 8 being amended to incorporate features of dependent claims 9 and 10 therein and now recite a non-magnetic and oxidized conductive film. Further, new dependent claims 11 - 16 have been added. Applicants submit that the recited features of the independent claims are not disclosed or taught in the cited art as will become clear from the following discussion.

With regard to the objection to the drawings, submitted herewith are corrected drawings of Figures 2 and 13 wherein the second reference numeral 121 of Fig. 2 has been changed to 123 and the writing gap 37 in Fig. 13 has been indicated. With respect to reference numeral 17 appearing in Fig. 4, the specification has been amended refer to the Ta layer 17. Thus, applicants submit that the drawing objections should now be overcome and submitted herewith are corrected drawings of Figs. 2 and 13 and acceptance of the corrected drawings is respectfully requested.

As to the informalities noted by the Examiner with regard to the claims and the rejection of claims 9 and 10 under 35 USC 112, second paragraph, applicants submit that by the present amendment, the informalities noted by the Examiner have been overcome and claims 9 and 10 have been amended to be in compliance with 35 USC 112, second paragraph, taking into consideration the Examiner's comments.

As to the rejection of claims 1, 3 - 4 and 6 - 10 under 35 USC 102(e) as being anticipated by Pinarbasi (US 6,268,985), this rejection is traversed insofar as it is applicable to the present claims and reconsideration and withdrawal of the rejection are respectfully requested.

As to the requirements to support a rejection under 35 USC 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 U.S.C. §102 requires that each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

As pointed out above, by the present amendment, independent claims 1 and 8 have been amended to recite the feature of a non-magnetic and oxidized conductive film as previously recited in dependent claims 9 and 10, respectively, which is disposed between a soft magnetic free layer and an oxide layer of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof in addition to the other features as recited which are laminated in a particular order on a substrate. Applicants note that as described in the specification of this application, at page 4, line 13 to the end of page 5, there is obtained a spin valve type magnetic head which is more excellent in sensitivity and capable of obtaining higher output than prior art structures by introducing both the oxide protective layer and the high conductance oxidized stopper layer to the spin valve film. More particularly, an metal oxide protective film is disposed on the soft magnetic free layer wherein as illustrated in Fig. 1 of the drawings of this application, the soft magnetic free layer is indicated by reference numeral 14 and the metal oxide protective film is indicated by reference numeral 16.

The oxide protective film is disposed on the soft magnetic free layer in order to provided improved change of resistance ΔR , with suitable metals for the oxide protective film being recited in claims 1 and 8 and Ta oxide being preferred with a view point of improving ΔR . Secondly, a non-magnetic high conductance oxidized stopper layer represented by reference numeral 15 in Fig. 1 is disposed between the oxide protective layer 16 and the soft magnetic layer free layer 14. As described in the paragraph bridging pages 4 and 5 of the specification of this application, the non-magnetic high conductance oxidized stopper layer prevents diffusion of oxygen from the oxide protective layer or propagation of stresses caused by oxide as far as the soft magnetic free layer and prevents degradation of the soft magnetic characteristic of the free layer. This prevents lowering of the sensitivity of the spin valve film and, further, prevents lowering of the output. Further, disposition of the non-magnetic high conductance oxidized stopper layer causes elastic scattering of itinerane electrons at the boundary between the non-magnetic high conductance oxidized stopper layer and the oxide protective film to extend the mean free stroke length of itinerane electrons so as to improve ΔR with respect to the prior art spin valve structures. Applicants note that the specification and the drawings of this application and in particular, Fig. 7A and 8A evidence the improvements obtained in the ratios of $\Delta R/R$ by the utilization of the metal oxide protective layer and the combination with the non-magnetic high conductance oxidized stopper layer in relation to a metal protective layer and without the non-magnetic high conductance oxide stopper layer (See Figs. 7B and 8B). Furthermore, as described at the first full paragraph of page 5 of the specification of this application, the thickness of the non-magnetic high conductance oxidized stopper layer is selected such that the inter layer coupling field is reduced to zero. When the non-magnetic high conductance oxidized stopper layer is disposed in the manner defined, the thickness of the non-magnetic high conductance oxidized stopper layer is selected such that the inter-layer coupling field

is substantially reduced to zero since the inter layer coupling field changes along the thickness of the conductive layer and this prevents lowering of the sensitivity caused by increase in the inter layer coupling field as illustrated in Figs. 11 and 12 of the drawings of this application which shows that the magnitude of the inter layer coupling field is substantially reduced to zero near the film thickness of 1.0 nm in Fig. 12 at which the change of resistance ΔR reaches a maximum in Fig. 11. Thus, by properly selecting the thickness of the non-magnetic high conductance oxidized stopper layer, it is possible to suppress the magnitude of the inter layer coupling field substantially to zero which enables preventing of the degradation of the sensitivity of the spin valve film. Applicants submit that the aforementioned features as recited in the independent and dependent claims of this application are not disclosed by Pinarbasi (US 6,268,985) in the sense of 35 USC 102.

In applying Pinarbasi (US 6,268,985) to the claimed invention, the Examiner contends that the soft magnetic free layer is represented by reference number 208, a non-magnetic and conductive film by reference numeral 504 and an oxide layer by reference numeral 506. More particularly, the Examiner contends that

"the intermediate layer coupling field showing the magnitude of the ferromagnetic coupling between the ferromagnetic pin layer and the soft magnetic free layer is substantially 0 (inherently due to the fact that it is structurally identical to that claimed) [as per claims 4 and 6-7]; and wherein the non-magnetic and conductive film is a non-magnetic and conductive oxidized stopper layer (504) which substantially prevents at least one of diffusion of oxygen from the oxide protective layer and propagation of stresses caused by oxides with respect to the soft magnetic free layer and degradation of the soft magnetic characteristic of the soft magnetic free layer (inherently due to the fact that it is

structurally identical to that claimed) [as per claim 9]." (emphasis added).

Irrespective of this position by the Examiner, applicants submit that there is no disclosure or teaching in Pinarbasi (US 6,268,985) that the layer 504 is a non-magnetic and conductive oxidized film or stopper layer as disclosed and claimed herein. Applicants have presented a disclosure of the necessity for the non-magnetic and conductive oxidized stopper layer and the improvements thereby with respect to ΔR . It is apparent that Pinarbasi (US 6,268,985) does not disclose improvement of the ratio of magnetic resistance (see $dR/R\%$) in charts A and B representing examples 1 and 2, for example, whether or not Pinarbasi may be considered to disclose a metal oxide protective film. As to the requirements of showing inherency, reference is made to the decision of In re Robertson, *supra*, and the Examiner's position that the same structure is claimed is in error in that there is no disclosure or teaching in Pinarbasi (US 6,268,985) of a non-magnetic and conductive oxidized film which is a non-magnetic and conductive oxidized stopper layer operating in the manner set forth, nor is there any disclosure concerning of the non-magnetic and conductive and oxidized film providing a substantially zero coupling field or the thickness of such film as recited in the dependent claims of this application. Thus, applicants submit that independent claims 1 and 8 and the dependent claims thereof patentably distinguish over this reference in the sense of 35 USC 102 and should be considered allowable thereover.

With respect to the newly added claims, applicants note that claims 11 - 14 recite the features of the thickness of the non-magnetic and oxidized conductive layer which is not disclosed or taught by Pinarbasi (US 6,268,985) in the sense of 35 USC 102.

In view of the above amendments and remarks, applicants submit that all claims present in this application patentably distinguish over the cited art and should

now be in condition for allowance. Accordingly, issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (501.39395X00) and please credit any excess fees to such deposit account.

Respectfully submitted,



Melvin Kraus
Registration No. 22,466
ANTONELLI, TERRY, STOUT & KRAUS, LLP

MK/jla
(703) 312-6600



FIG. 1

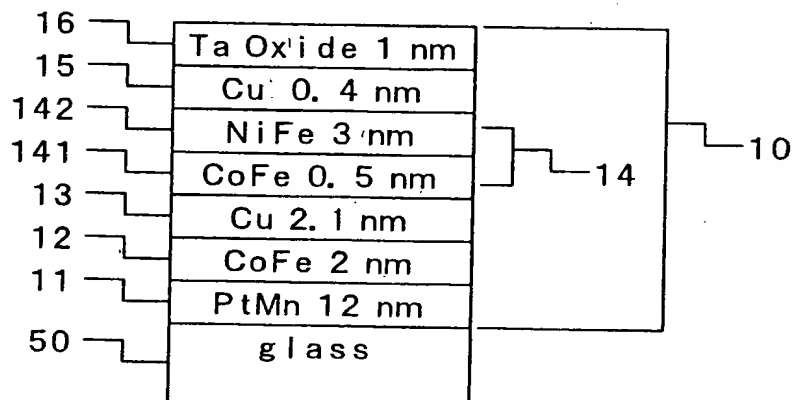


FIG. 2

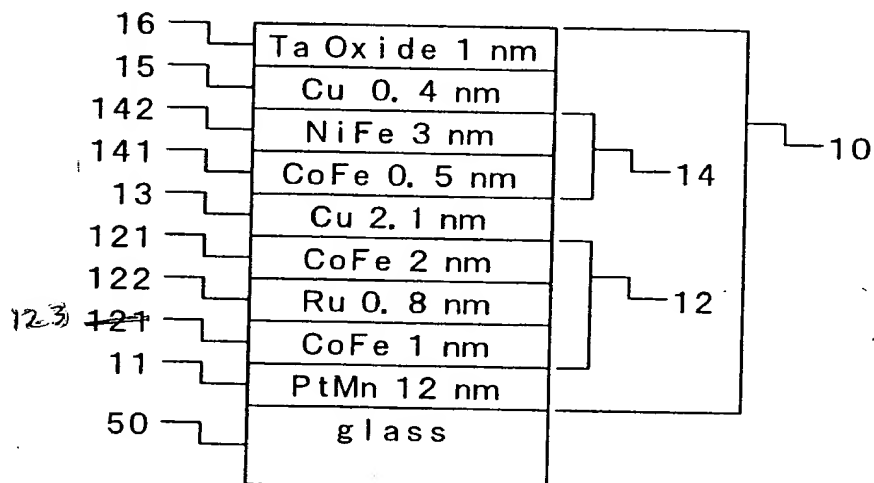


FIG. 13

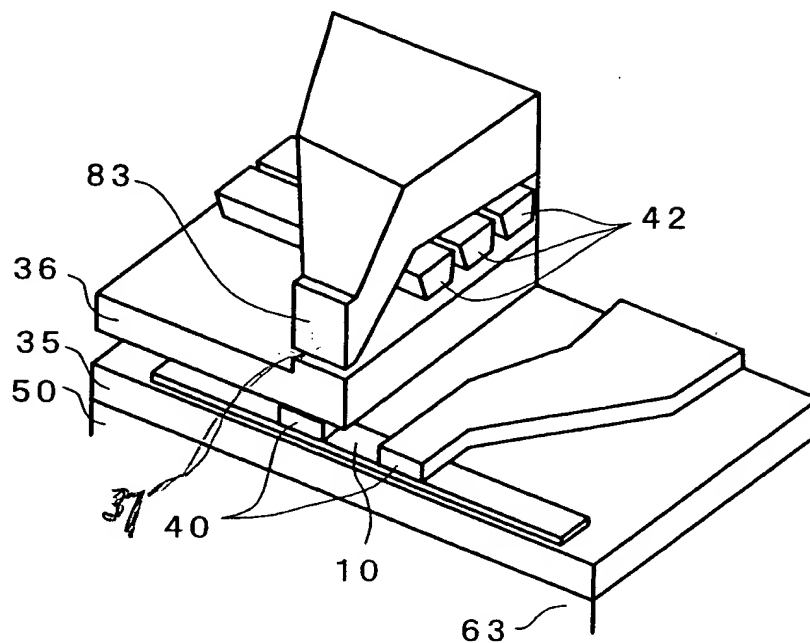


FIG. 14

